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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/550,853	09/22/2005	Philippe Meunier-Beillard	NL03 0357 US1	6408
65913	7590	04/30/2008	EXAMINER	
NXP, B.V. NXP INTELLECTUAL PROPERTY DEPARTMENT M/S41-SJ 1109 MCKAY DRIVE SAN JOSE, CA 95131			NGUYEN, KHIEM D	
			ART UNIT	PAPER NUMBER
			2823	
			NOTIFICATION DATE	DELIVERY MODE
			04/30/2008	ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ip.department.us@nxp.com

<b>Office Action Summary</b>	<b>Application No.</b> 10/550,853	<b>Applicant(s)</b> MEUNIER-BEILLARD ET AL.	
	<b>Examiner</b> KHIEM D. NGUYEN	<b>Art Unit</b> 2823	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 13 February 2008.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7 and 13-16 is/are rejected.
- 7) ☒ Claim(s) 8-12 and 17 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Remarks***

1. In view of the Appeal Brief filed on February 13<sup>th</sup>, 2008, PROSECUTION IS HEREBY REOPENED. A new ground of rejection is set forth below.

To avoid abandonment of the application, appellant must exercise one of the following two options:

(1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,

(2) initiate a new appeal by filing a notice of appeal under 37 CFR 41.31 followed by an appeal brief under 37 CFR 41.37. The previously paid notice of appeal fee and appeal brief fee can be applied to the new appeal. If, however, the appeal fees set forth in 37 CFR 41.20 have been increased since they were previously paid, then appellant must pay the difference between the increased fees and the amount previously paid.

A Supervisory Patent Examiner (SPE) has approved of reopening prosecution by signing below:

/Matthew S. Smith/

Supervisory Patent Examiner, Art Unit 2823

### ***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

Art Unit: 2823

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-3, 5, 13, 15 and 16 are rejected under 35 U.S.C. 102(b) as being anticipated by Dietze et al. (U.S. Patent 6,184,154).

In re claim 1, **Dietze et al.** disclose a method of manufacturing a semiconductor device with a semiconductor body comprising

silicon **10** provided with an n-type doped semiconductor region comprising silicon formed by an epitaxial deposition process (see col. 5, lines 6-12), wherein

the epitaxial deposition process of the n-type region is performed by positioning the semiconductor body **10** in an epitaxial reactor **11** (see col. 5, lines 6-19 and FIGS. 1-2) and

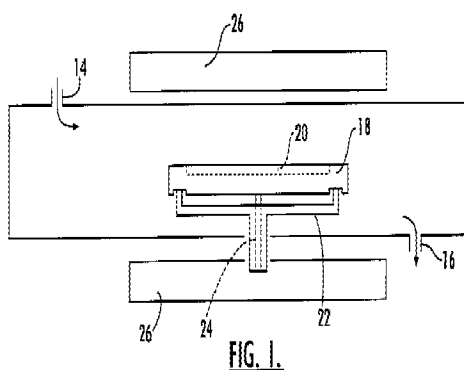


FIG. 1.

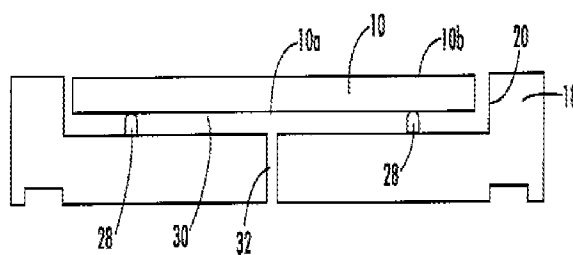


FIG. 2.

introducing in the reactor **11** a first gas stream comprising a carrier gas ( $N_2$ ) (see col. 7, line 26-28) and further gas streams comprising a gaseous compound comprising silicon (silane ( $SiH_4$ ) and (dichlorosilane ( $SiH_2Cl_2$ )) and a gaseous compound comprising an element from the fifth column of the periodic system of elements (phosphorous) (see col. 7, lines 29-41), while

heating the semiconductor body **10** to a growth temperature ( $T_g$ ) (see col. 7, lines 40-41) and using an inert gas as the carrier gas ( $N_2$ , see col. 7, line 27), characterized in

that for the gaseous compound comprising silicon a mixture is chosen of a first gaseous silicon compound (silane) ( $\text{SiH}_4$ ) which is free of chlorine and a second gaseous silicon compound (dichlorosilane) ( $\text{SiH}_2\text{Cl}_2$ ) comprising chlorine (see col. 7, lines 35-41).

In re claim 2, as applied to claim 1 above, **Dietze et al.** disclose all claimed limitations including the limitation characterized in that the first gaseous silicon compound silane ( $\text{SiH}_4$ ) is chosen and for the second gaseous silicon compound dichlorosilane ( $\text{SiH}_2\text{Cl}_2$ ) is chosen (see col. 7, lines 35-41).

In re claim 3, as applied to claim 1 above, **Dietze et al.** disclose all claimed limitations including the limitation characterized in that for the gaseous compound comprising a V-element, phosphine is chosen (see col. 7, line 39).

In re claim 5, as applied to claim 1 above, **Dietze et al.** disclose all claimed limitations including the limitation characterized in that the epitaxial deposition process is performed at reduced pressure (P) (see col. 7, lines 26-27).

In re claim 13, as applied to claim 1 above, **Dietze et al.** disclose all claimed limitations including the limitation characterized in that nitrogen ( $\text{N}_2$ ) is chosen as the inert gas (see col. 7, lines 26-27).

In re claim 15, as applied to claim 1 above, **Dietze et al.** disclose the semiconductor device obtained by the method as recited in claim 1 (see col. 7, lines 20-62).

In re claim 16, as applied to claim 1 above, **Dietze et al.** disclose all claimed limitations including the limitation characterized in that the apparatus comprises a deposition reactor and is provided with a first source for a gaseous compound of silicon

(silane) ( $\text{SiH}_4$ ) which is free of chlorine and a second source for a gaseous compound of silicon (dichlorosilane) ( $\text{SiH}_2\text{Cl}_2$ ) which comprises chlorine (see col. 7, lines 34-41).

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 4 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dietze et al. (U.S. Patent 6,184,154).

In re claims 4 and 6, as applied to claims 1 and 5, respectively, Paragraph 3 above, **Dietze et al.** do not specifically disclose that the growth temperature ( $T_g$ ) is in the range between 500 °C and 600 °C and a pressure (P) is chosen between 120 and 160 Torr.

However, there is no evidence indicating the growth temperature and the pressure ranges is critical and it has been held that it is not inventive to discover the optimum or workable growth temperature and pressure ranges of a result-effective variable within given prior art conditions by routine experimentation. See MPEP § 2144.05. Note that the specification contains no disclosure of either the critical nature of the claimed dimensions of any unexpected results arising there from. Where patentability is aid to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

6. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dietze et al. (U.S. Patent 6,184,154) in view of Mizushima et al. (U.S. Patent 6,395,621).

In re claim 7, as applied to claim 1, Paragraph 3 above, **Dietze et al.** do not specifically disclose characterized in that for the semiconductor device a MOSFET device is chosen and the semiconductor region is formed as a source or drain of the MOSFET device.

**Mizushima et al.**, however, disclose a method of manufacturing a MOSFET device wherein a semiconductor region which is formed by epitaxial growth technique is an elevated source/drain structure of the MOSFET device (see col. 16, lines 6-47 and FIGS. 12A-D).

As **Mizushima et al.** disclose, one of ordinary skill in the art would have been motivated to provide an epitaxially grown semiconductor region which is formed as a elevated source or drain structure of the MOSFET device in order to raise the density and the performance of the semiconductor device and furthermore, to reducing the manufacturing steps and lower the cost of the material (see col. 4, lines 14-21 of Mizushima et al.). As known to one of ordinary skill in the art, epitaxially formed elevated source/drain architecture is a possible route for deep submicron CMOS and has been proved effective in allowing both junction depth reduction and leakage control of silicided junctions, thereby resulting in scalability.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of applicant(s) claimed invention was made to modify **Dietze et al.** reference with the method of epitaxially forming the elevated source/drain structure for the MOSFET

device as taught by **Mizushima et al.** in order to raise the density and the performance of the semiconductor device and furthermore, to reducing the manufacturing steps and lower the cost of the material (see col. 4, lines 14-21 of Mizushima et al.). Additionally, epitaxially formed elevated source/drain architecture is a possible route for deep submicron CMOS and has been proved effective in allowing both junction depth reduction and leakage control of silicided junctions, thereby resulting in scalability.

7. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dietze et al. (U.S. Patent 6,184,154) in view of Meyerson (EP 0 459 122 A (IBM)), of record).

In re claim 14, as applied to claim 1 Paragraph 3 above, **Dietze et al.** do not specifically disclose characterized in that the semiconductor region or the further semiconductor region are formed as a mixed crystal of silicon and germanium by leading a yet another gas stream to the reactor comprising a gaseous compound of germanium.

**Meyerson**, however, discloses a method of manufacturing a semiconductor device with a semiconductor body comprising silicon provided with an n-type doped semiconductor region comprising silicon formed by an epitaxial deposition process characterized in that the semiconductor region are formed as a mixed crystal of silicon and germanium by leading a yet another gas stream to the reactor comprising a gaseous compound of germanium (see col. 3, lines 8-17).

As **Meyerson** discloses, one of ordinary skill in the art would have been motivated to provide the step of epitaxially forming semiconductor region as a mixed crystal of silicon and germanium by leading a yet another gas stream to the reactor



comprising gaseous compound of germanium in order to obtain a semiconductor device having abrupt n-type doping profiles (see col. 2, lines 41-43 of Meyerson).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of applicant(s) claimed invention was made to modify **Dietze et al.** reference with the step of epitaxially forming semiconductor region as a mixed crystal of silicon and germanium by leading a yet another gas stream to the reactor comprising gaseous compound of germanium as taught by **Meyerson** in order to obtain a semiconductor device having abrupt n-type doping profiles (see col. 2, lines 41-43 of Meyerson).

***Allowable Subject Matter***

8. Claims 8-12 and 17 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

After further search and consideration of Applicants' response in the Appeal Brief filed on February 13<sup>th</sup>, 2008 (see Applicants' response in Page 5, lines 10-21 of the Appeal Brief), it is determined that the prior art of record neither anticipates nor renders obvious the claimed subject matter of the instant application as a whole taken alone or in combination, in particular, prior art of record does not teach "after the growth of the n-type semiconductor region comprising silicon the deposition process is continued with the growth of a further semiconductor region comprising a lower n-type doping than the semiconductor region or comprising a p-type doping and in that at least between the growth of the semiconductor region and the growth of the further semiconductor region, the inert carrier gas is replaced by a carrier gas comprising hydrogen", as recited in the

Art Unit: 2823

dependent claim 8 and "a first carrier gas source comprising an inert gas and a second carrier gas source comprising hydrogen and with means to switch the carrier gas from the inert gas to hydrogen during the deposition process", as recited in dependent claim 17.

Claims 9-12 also objected to as being directly or indirectly dependent of the objected base claim 8.

***Response to Applicants' Amendment and Arguments***

9. Applicants' arguments, see pages 3-4 of the Appeal Brief, filed on February 13<sup>th</sup>, 2008, with respect to the rejection(s) of claim(s) 1-5 and 7-17 under 35 U.S.C. 102(b) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Dietze et al. (U.S. Patent 6,184,154), Mizushima et al. (U.S. Patent 6,395,621), and Meyerson (EP 0 459 122 B1).

***Conclusion***

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to KHIEM D. NGUYEN whose telephone number is (571)272-1865. The examiner can normally be reached on Monday-Friday (8:30 AM - 5:30 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew S. Smith can be reached on (571) 272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2823

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Khiem D. Nguyen/  
Examiner, Art Unit 2823